PATENT SPECIFICATION (11) 1 586 431

1 586 431

(21) Application Nos. 8319/78 (22) Filed 2 Mar. 1978
14140/78 11 Apr. 1978

(23) Complete Specification Filed 31 May 1978

(44) Complete Specification Published 18 Mar. 1981

(51) INT. CL.[3] H04L 3/00
G06F 3/153

(52) Index at Acceptance
H4T 4R BRB

(72) Inventors: GERALD OFFLEY CROWTHER
JOHN RITCHIE KINGHORN

(19)

(54) DATA TRANSMISSION

(71) We, PHILIPS ELECTRONIC AND ASSOCIATED INDUSTRIES LIMITED, of Abacus House, 33 Gutter Lane, London, EC2V 8AH a British Company, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:

The invention relates to a television transmission system of a character such that data pulses coded in a given manner to represent a message comprising specific alpha-numeric text or other message or graphical information are transmitted in a video signal in at least one television line in intervals where no picture signals representing normal picture information are present, the message comprising a plurality of rows, the pulses for each row being contained in a television line, one of said rows containing a message-starting and/or identification signal when said text or other information is to be interpreted in a corresponding given manner.

Such a system is employed in the United Kingdom Teletext transmissions the specification for which is given in the joint British Broadcasting Corporation, Independent Broadcasting Authority and British Radio Equipment Manufacturers' Association publication "Broadcast Teletext Specification" of September 1976. The Teletext transmissions in the United Kingdom are all in one language, namely English and the character generator employed in the decoding apparatus for these transmissions produces English language characters from the character codes of the transmission. If such transmissions were provided in a country whose national language uses additional characters to those of the English language or characters which differ to English language characters it would be a simple matter to provide the decoding apparatus for these transmissions with a character generator for the alphabet of the country concerned. Such a simple solution however does not fit the needs of a country whose neighbouring countries have languages whose alphabets differ from that of its national alphabet. Such a situation can be found at a number of places on the Continent of Europe where in addition to the basic Latin alphabet different countries employ different accented characters. One way of overcoming this problem and allowing reception of different Teletext transmissions in different languages is proposed in B.B.C. Engineering, December 1977, page 2 in the article "Alphabets for CEEFAX" where it is suggested that different character generators (character Read-Only-Memories) providing different character sets could be selected according to the language transmitted by using control bits on each page to select the correct character set for that page. The control bits which it is suggested could be used are C12, C13 and C14 contained in the Page-Header (Row 0) which are at present unallocated and which are shown in Figure 6 on page 14 of the above mentioned "Broadcast Teletext Specification". A major drawback of this proposal is that existing decoder designs would respond to these varying transmissions but would not be able to change the character set when receiving a language which differed to that of its character generator. An existing decoder would then reproduce a page of the transmission as a display containing errors.

A difficulty that has been experienced with the above mentioned "Broadcast Teletext Specification" publication is in the interpretation of the term "Hold Graphics" which is defined at 3.1.7 of page 8 of the publication as:-

Generally all Control Characters are displayed as Spaces, implying at least one Space between rectangles with different Display Colours in the same Row. The Hold Graphics

mode allows a limited range of abrupt Display Colour changes by calling for the display of a Held Graphics Character in the rectangle corresponding to any Control Character occuring during the Graphics Mode. This Held Character is displayed in the modes obtaining for the rectangle in which it is displayed, except for the contiguous/Separated Mode which forms part of the structure of the Held Graphics Character.

The Held Graphics Character is only defined during the Graphics Mode. It is then the most recent character with $b_6=1$ in its character code, providing that there has been no intervening change in either the Alphanumerics/Graphics or the Normal/Double Height modes. This character is to be displayed in the Contiguous or Separated Mode as when it was first displayed. In the absence of such a character the Held Graphics Character is taken to be a Space.

Two interpretations have been placed on this definition used and the difference between the two interpretations may loosely be described as follows:-

1. The previous displayed Graphic Character is the held character.
2. The previous transmitted Graphic Character is the held character.

The two interpretations do not cause a problem in a television receiver except the case where on entering the Hold Graphics mode in a decoder if the Graphics Hold Character is preceded by a second control character when this difference in interpretation may lead to an erroneous display in a small percentage of the pages employing Hold Graphics. For the present, conflict has been avoided by the Broadcasting Authorities agreeing not to transmit pages which employ Hold Graphics in such a manner that it could be misinterpreted by any of the current decoders. It is, however, desirable that in the long term an agreed interpretation of Hold Graphics should be established. It is also essential that when this is established the current decoders already incorporated in television receivers should not suddenly produce a false display.

In Teletext transmissions the alpha-numeric text or other message or graphical information either for display or for control functions are transmitted as data-pulses coded in a given manner as specified in the above publication. There may be circumstances when it is desirable to transmit the data-pulse codes having a different meaning to that given in the above mentioned publication. However this would have the difficulty that current Teletext decoders designed to interpret the data pulses in accordance with the specification given in that publication would interpret the differently coded data pulses incorrectly.

It is an object of the invention to provide a data transmission system and apparatus which overcomes difficulties typified above and capable of handling data pulses coded differently to a given manner without rendering existing decoders or existing decoder designs obsolete.

The invention provides a television transmission system of a character such that data pulses coded in a given manner to represent a message comprising specific alpha-numeric text or other message or graphical information are transmitted in a video signal in at least one television line in intervals where no picture signals representing normal picture information are present, the message comprising a plurality of rows, the pulses for each row being contained in a television line, one of the said rows containing a message-starting and/or identification signal when the coding of said text or other information is to be interpreted in a corresponding given manner, an alternative row other than one of those employed when the data pulses are coded in said given manner being employed to contain the message-starting and/or identification signal when the message is contained in that row or a plurality of rows and the coding of the data pulses is to be interpreted in a manner which differs or varies from that of the given manner.

Such a transmission system has the advantage that existing decoders will not respond to the message when the coding is to be interpreted in a manner which differs or varies from that of the given manner and will not produce a display which contains incorrect information. A current message may have said one row containing the message-starting and/or identification signal also containing a terminating signal for a preceding message, the current message being terminated by a row without a message-starting signal when the current message is followed by a message commencing with said alternative row. This is necessary for existing decoders to ensure that the rows of the following message do not contribute to the display of the current message.

The text of the message having said one row containing the message-starting and/or identification signal may be in a first language whilst the text of the message having said alternative row containing the message-starting and/or identification signal may be in a second language. Alternatively the text of the message having said one row containing the message-starting and/or identification signal may be in a first language whilst the text of the message having said alternative row containing the message-starting and/or identification signal may be in different languages for different rows. In such a case an alternative row other than one of those employed when the message is in said first language may be transmitted between adjacent rows when in different languages.

In a further alternative the text of the message having said one row containing the message-starting or identification signal may in a first language whilst the characters of each row from the message having said alternative row containing the message-starting and/or identification signal may be selected from different character sets such that different parts of the message in each row may be in different languages. The message having said alternative row containing the message-starting and/or identification signal may then be transmitted twice, the first transmission of the message indicating for each character position in a row the character set from which the character codes for each corresponding position in a row are to be derived during the second transmission.

Variations in the interpretation of the coding of the data pulses may be achieved by the selection during at least parts of the message having said alternative row containing the message-starting and/or identification signal of characters or graphical information transmitted in dot coded form. The message having said one row containing the message-starting and/or identification signal when decoded may be derive its characters from a first character set, the message having said alternative row containing the message-starting and/or identification signal being transmitted twice with the dot coded characters or graphical information being transmitted during the first transmission whilst character codes are transmitted during the second transmission which when decoded derives some of its characters or graphical information from said first character set and the remaining from the previously transmitted dot coded characters or graphical information.

The interpretation for the coding of at least one control character contained in said message having said alternative row containing the message-starting and/or identification signal may differ from the interpretation for the coding of that control character when contained in said message having said one row containing the message-starting and/or identification signal.

The alternative row may contain a further signal which indicates the nature of the differences or variation in interpretation of the coding of the data pulses. This further signal may be contained in control codes following the message-starting and/or identification signal or it may be that signal which indicates the row number.

The invention also provides decoding apparatus for the above television transmission system, said apparatus comprising means for providing a demodulated video signal containing data pulses coded in a given manner to represent a message comprising specific alphal-numeric text or other message or graphical information during at least one television line in intervals where no picture signals representing normal picture information are present, the message comprising a plurality of rows each row being contained in a television line, means for separating the television lines containing said rows from said demodulated video signal, means for responding to one of said rows which contains a message-starting and/or identification signal and for decoding said message such that its coding is interpreted in a corresponding given manner, means for responding to an alternative row other than one of those employed when the data pulses are coded in said given manner and which contains the message-starting and/or identification signal and for decoding said message such that its coding is interpreted in a manner which differs or varies from that of said given manner, and means for producing a vision signal containing said message for display purposes. Such apparatus has the advantage that existing decoders will not produce signals for display when the interpretation placed on the coding differs or varies from the given manner.

A first character generator may be provided for producing characters from a first character set from character codes in said message having said one row containing said message-starting and/or identification signal, a second character generator being provided for producing characters from a second character set from character codes in said message having said alternative row containing said message-starting and/or identification signal. This allows different messages to be in different languages.

Alternatively a first character generator may be provided for producing characters from a first character set from character codes in said message having said one now containing said message-starting and/or identification signal, further character generators being provided for producing characters from further character sets from the character codes in different rows in said message having said alternative row containing said message-starting and/or identification signal. With such an arrangement different rows of a message may be in different languages.

As a further alternative a first character may be provided for producing characters from a first character set from character codes in said message having said one row containing said message-starting and/or identification signal, further signal generators being provided for producing characters from further character sets from the character codes in said message having said alternate row containing said message-starting and/or identification signal, and means capable of selecting characters from different character sets at different character

code positions in said message. As the characters may be selected from different character generators, then different words in a row may be in different languages.

As an additional alternative a first character generator may be provided for producing characters from a first character set from character codes in said message having said one row containing said message-starting and/or identification signal, a character set memory for storing characters or graphical information when transmitted in dot coded form in a first transmission of said message having said alternative row containing said message-starting and/or identification signal, and means for deriving characters or graphical information from said first character generator or said character set memory during a second transmission of said message having said alternative row containing said message-starting and/or identification signal.

The invention further provides television display apparatus incorporating decoding apparatus as described above which further comprises display means for displaying the decoded message.

The above and other features of the invention will now be described, by way of example, with reference to the accompanying drawings in which:-

Figure 1 shows characters constructed on a 6 × 10 matrix,

Figure 2 shows accented characters constructed on a similar matrix,

Figure 3 shows a table of character codes used in an existing data transmission system,

Figure 4 shows a table of character codes according to international standard ISO 646,

Figure 5 shows the synchronising and Hamming codes at the start of a page-header and row transmissions for an existing data transmission system,

Figure 6 is a block diagram of a television receiver incorporating a decoder for a data transmission system,

Figure 7 is a block diagram of a Teletext Acquisition circuit for use in the decoder in Figure 6 according to the invention, and

Figure 8 is a block digram of character generating apparatus for use with the circuit of Figure 7.

In the United Kingdom Teletext system, a format of 24 rows of 40 characters was chosen for the display which provides a compromise between definition and a large number of characters against the limitations of the 625 line television scanning system. Allowing for overscan, about 40μ seconds per line and 240 lines per Teletext display vertically are available. Each character position therefore occupies 1μ second × 10 lines on the display screen and using a 6MHz dot rate (which is sufficiently low for normal video amplifiers) the character matrix is 6 × 10, or 5 × 10 allowing for the space between characters a shown in Figure 1. All displayed characters must therefore fit into this 5 × 10 matrix.

Where for languages other than English it is required to display accented characters from the Latin alphabet there is therefor insufficient space to add accents to a normal-sized upper case character and the only way to keep to the character matrix is to reduce the height of these characters as is shown in Figure 2. In Figure 2*a* an upper case O is shown without an accent whilst an upper case O and an upper case A both accented are shown in Figures 2*b* and *c* respectively. The separate transmission of the accent followed by the character is not practical for a scanned cathode ray tube display and therefore for such a display the character and its accent must be transmitted as a single character.

The character codes used in the United Kingdom Teletext system are shown in Figure 3 which corresponds to Table 3 of the "Broadcast Teletext Specification" publication mentioned above, these character codes being based on the displayed character codes of the international standard ISO 646 which is shown in Table 4. A comparison of columns 2, 3, 4, 5, 6 and 7 of Figures 3 and 4 shows the 96 characters from each of these Figures to be substantially identical except for the eleven positions in Figure 4 indicated by cross hatching which are reserved in this international standard for national use options. A study of the Centre Commun d' Etudes de Telecommunications et Television (C.C.E.T.T.) Report TSA/T/14/77, "Problems Linguistiques du Teletexte. Etudes des langues Europeennes utilisant l'alphabet Latin - Rapport final", Rennes, July 1977 reveals that the character requirements of all the major European languages can be met with seven character sets based on Figure 4, which sets only differ in the use of the elevent national use character options. The differences in the use of these eleven national use character options for the various character sets is as follows:

Character Set	*National use Characters*
1. English (Present U.K. Teletext)	@ – ← $^1_2$ → ↑ # $^1_4$ ‖ $^3_4$ ÷
2. Dutch/German	Ä ä ë ß Ö ¨ Ü ü β
3. Scandinavian	Ä ä Å å Æ æ Ö ö Ø ø
4. Italian/Spanish	á à é è ß ó ò ú ù ñ Ñ
5. French	à â é è ê ë î ô ù û ç
6. Turkish/Hungarian	ö õ ü ü ı ğ ş á é ç
7. Croatian/Rumanian/ Slovenian	ć č đ š ž ă ş ţ Ă ş Ţ

Apart from a small number of very seldom-used symbols, the only European languaes not entirely catered for in these seven character sets are Icelandic, Lappish and Maltese.

Thus for Teletext transmissions in the major European languages the coding of the international standard ISO 646 could be adopted and for each character set it is possible to use a character generator dedicated to that character set. Where a television receiver is used in a location where it is possible only to receive Teletext transmissions in one language then only the character generator suitable for decoding the coded characters in that language is required. However where the receiver is to be used in a location where it possible and desired to receive Teletext transmissions in different languages the receiver could employ an appropriate number of character generators corresponding to the number of character sets to be decoded. As many of the characters between the languages are the same the separate character generators could be formed from a single character generator capable of having the eleven national character options decoded according to the language. Whilst a method of selecting the character generator has been suggested such a method alone would not be suitable for use with existing designs of Teletext decoder. The reason for this will be explained with reference to Figure 5 which corresponds to Figure 6 of the above mentioned "Broadcast Teletext Specification" and which shows the synchronisation and Hamming codes at the start of the Page Header and subsequent row transmissions as explained in that publication. The Page Header is Row 0 and contains the starting and identification signal for the message on the page and sequentially contains a Clock Run-in sequence and Framing Code for synchronisation, a Magazine and Row address, a Page Number Code, a Time Code, a series of Control Bits, and codes for the characters in that row. The Control Bits are numbered C4 to C14, Bit C4 appearing in the middle of the Time Code, and are allocated specific functions except for the last three bits C12, C13 and C14 which are at present unallocated and transmitted as 000. The Page Header Row 0 in addition to starting the message page also acts as a terminator for the preceding page. The following Rows 1 to 23 each contain the Clock Run-in sequence and Framing Code, the Magazine and Row address followed by the character codes, (Bytes) for that row. All the control and addressing information contained in the rows is fully Hamming protected. It would be possible to transmit Rows 24 to 31 but at present these are unallocated and present decoders will not respond to these Rows. Pages of Teletext information are transmitted sequentially and typical pages will be made up of Rows in the following manner:-

Row 0, Page (n-1) - Terminator for Page (n-2), Starter for Page (n-1)

Row 1.

Row 23

Row 0 Page n - Terminator for Page (n-1), Starter for Page n

Row 1

Row 23

Row 0 Page (*n*+1) - Terminator for Page *n*, Starter for Page (n+1)

The suggested method of selecting the specific character set for a page has been to utilise the control Bits C12, C13 and C14 in the Page Header Row 0 and which would allow eight character sets to be selected. However whilst existing decoder designs would respond to the transmissions in the different languages they would not, of course, change languages and when different languages were transmitted other than that for which the decoder were designed there would be a number of incorrect characters in the displayed pages.

The above difficulty may be overcome by using what might be termed a Secondard Page Header in situations where it is desired to transmit Teletext information in different languages. This Secondary Page Header will have the same format as a Row 0 Page Header and will be in a row which is not used in current Teletext pages and which is ignored by existing decoder designs. Possible rows that could be used are the Rows 24 to 31 whose use is not at present defined. When Teletext information is to be transmitted in a number of languages using different character sets a first language transmission could use the Row 0 as the Page Header Row to which existing decoder designs would respond whilst other language transmissions would use a Secondary Page Header Row 24 and the required character sets for the different languages could be selected as previously proposed by the Control Bits C12, C13 and C14. Existing decoder designs would not respond to Pages which use the Secondary Page Header Row. In order to ensure with existing decoder designs that each page which can be decoded is terminated, a separate terminator should preferably be sent following a page in a first language and before a page in a secondary language as the Secondary Header Row would not act as a Terminator for such decoders. The terminator should be that for a page which cannot be selected by any decoder, a suitable Terminator being Row 0 page 15 15. Pages of Teletext information may be built up in the following manner:-

Row 0 Page *n* - 1st language - 1st character set.

Row 1 character data

Row 23 character data

Row 0 Page 15 15 (Terminator)

Row 24 Page *n* + 1 - 2nd language, Control Bits select 2nd character set.

Row 1 character data

Row 23 character data

Row 24 Page *n*+2 - 3rd language, Control Bits select

Row 1 character data

Row 23 character data.

etc.

For decoders designed to select the different character sets the Row 24 would act as a terminator for previous Pages using this Secondary Page Header Row. If all transmissions were sent using the Secondary Page Header then Row 0 would not be used and it would not be necessary to use the separate Row 0 Page 15 15 Terminator. In this case existing decoder designs would not respond to any of the page transmissions.

The proposal above uses the Control Bits C12, C13 and C14 for selecting the different character sets. However the Secondary Page Header Row number itself might be used to select the different character sets in the following manner:-

Row 0 Page *n* - 1st language, 1st character set

Row 1 character data

.

.

.

Row 23 character data

Row 0 Page 15 15 (Terminator)

Row 24 Page *n*+1 - 2nd language, Row Code selects 2nd character set.

Row 1 character data

.

.

.

Row 23 character data

Row 25 Page *n*+2 - 3rd language, Row Code selects 3rd character set

Row 1 character data

.

.

.

Row 23 character data

etc.

As described above, each page is shown to be in a different language. However it may be required to display pages where the language varies from row to row. Where this is done by the Control Bits C12, C13 and C14 selecting the appropriate character set the pages may have the following structure:-

Row	0	Page *n* - 1st language, 1st character set
Row	1	character data
	.	.
	.	.
	.	.
	.	.
Row	23	character data
Row	0	Page 15 15 (Terminator)
Row	24	Page *n*+1 - 2nd language, Control bits select 2nd character set
Row	1	character data for 2nd character set
Row	24	Page *n*+1 - 3rd language, Control Bits select 3rd character set
Row	2	character data for 3rd character set
Row	24	Page n+1 - 4th language, Control Bits select 4th character set
Row	3	character data for 4th character set
	.	.
	.	.
	.	.
	.	.
Row	24	page *n*+1 - 3rd language, Control Bits select 3rd character set
Row	23	character data for 3rd character set

etc.

Where the Row Code itself selected the character set the pages would appear as follows:-

Row 0 Page *n* - 1st language, 1st character set

Row 1 character data

Row 23 character data

Row 0 Page 15 15 (Terminator)

Row 24 Page *n*+1 - 2nd language, Row Code selects 2nd character set

Row 1 character data for 2nd character set

Row 25 Page *n*+1 - 3rd language, Row Code selects 3rd character set

Row 2 character data for 3rd character set

Row 26 Page *n*+1 - 4th language, Row Code selects 4th character set

Row 3 character data for 4th character set

Row 25 Page *n*+1 - 3rd language, Row Code selects 3rd character set

Row 23 character data for 3rd character set

Row 26 Page *n*+2 - 4th language, Row Code selects 4th character set

Row 1 character data for 4th character set

etc.

The above systems allow a different character set to be selected for different pages or for different rows of a page. It may be considered that this is too limited for some purposes and therefore the following allows a different character set to be selected at each character position of the page. In such a system a Secondary Page Header Row would again be used and each page would be transmitted twice but containing different information. On the first occasion the Control Bits C12, C13 and C14 would be coded to instruct the decoder that the Character Bytes for each Row were coded to indicate which character set is to be selected at each character location on the second transmission of that page. During the second transmission of the page the Control Bits C12, C13 and C14 would be coded to instruct the decoder that the character Bytes for each Row were coded characters but each one was to be selected from the character set selected during the previous transmission of this page.

The structure of the pages would then be as follows:-

Row	0	Page *n* - 1st language, 1st character set
Row	1	character data
		.
		.
		.
		.
Row	23	character data
Row	0	Page 15 15 (Terminator)
Row	27	Page *n*+1 - 1st transmission, Control Bits coded for Character Bytes to indicate character set at each Byte location
Row	1	character set data
		.
		.
		.
		.
Row	23	character set data
Row	27	Page *n*+1 - 2nd transmission, Control Bits coded for Character Bytes to indicate which character is to be selected from the character set as indicated in first transmission
Row	1	character data selected as above
		.
		.
		.
		.
Row	23	character data selected as above

etc.

Instead of using the Control Bits C12, C13 and C14 to indicate the different purposes of the Character Bytes in the two transmissions, the Row Code could be used for this purpose in which case two different Secondary Header Rows would be used for the two transmissions of the page.

Where characters are required in a display which do not form part of a character set or where only a limited number differ from a standard character set then, as already proposed, these non-standard characters could be sent as dots in the rows of a page for storage and subsequent retrieval. Ten of the normal eight-bit words (Character Bytes) of each row would be used for each character, each word containing the six horizontal dots, leaving two bits for protection, providing four characters per row. As before a Secondary Header Row would be used whose Control Bits C12, C13 and C14 would instruct the decoder to store the characters transmitted and in a second transmission of that page could instruct the decoder to select the stored characters at certain locations in the display when a given character Byte appears and thus certain of the character Bytes would have their meaning varied.

Information transmitted in this way would appear as follows:-

Row 0 Page *n* - 1st language, 1st character set

Row 1 character data

.
.
.
.
.

Row 23 character data

Row 0 Page 15 15 (Terminator)

Row 28 Page *n*+1 - 1st transmission, Control Bits coded for Character Bytes indicate dots to be stored to form characters.

Row 1 character dot data

.
.
.
.
.

Row 23 character dot data

Row 28 Page *n*+1 - 2nd transmission, Control Bits coded for normal character set except for certain codes which indicate that previously transmitted and stored characters are to be selected

Row 1 character data

.
.
.
.
.

Row 23 character data

etc.

As stated previously, the Row Code could be used to indicate the control function instead of the Control Bits and again two different Secondary Header Rows would be required for the two transmissions of the page.

So far consideration has been given to the ability for Teletext transmissions to take place in a number of languages either by selecting specific character sets or by transmitting additional characters in dot form for storage in the decoder when using a Secondary Page Header Row. The Secondary Page Header Row may also be used when it is desired to change the meaning of a Control Character in a transmission. The Control Characters are present in columns 0 and 1 of Figure 3. Thus if the code corresponding to 1/14 of Figure 3 is transmitted with a standard Page Header Row 0 then an existing design decoder will instruct its character generator to Hold Graphics in whichever way the designer of the decoder has adopted bearing in mind the two interpretations which may be placed on this function as stated earlier in this specification. However with the present invention if a Secondary Page Header Row were transmitted with pages having Graphics Hold it would be possible for manufacturers to design decoders in which this function were given a single interpretation with the agreement of the Broadcast Authorities.

Functions other than Graphics Hold may be changed when using a Secondary Page Header Row and also the codes appearing in Figure 3 could have their meaning or function changed to those codes which are at present Control Codes or Character Codes. Either the Control Bits C12, C13 and C14 or the number of the Secondary Page Header Row might be used as the change of function for the Control Characters. The Teletext pages would appear as follows:-

Row 0 Page *n* Control Characters to have normal function

Row 1 character data

.
.
.

Row 23 character data

Row 0 Page 15 15 (Terminator)

Row 29 Page *n*+1 Control Characters to have changed functions.

Row 1 character data

.
.
.

Row 23 character adata

etc.

Previously the message or information has been contained in a Page which comprises a number of Rows normally 24. It would however be possible to transmit a single Row within Rows 24 to 31 which could perform the control of a function either inside or outside of a television receiver this Row serving as its own Secondary Page Header.

Where the message or information is contained within an effective Page comprising a number of Rows it may also be used to perform a control function which again may be either inside or outside of a television receiver. One particular application where such a control function could be performed is with the system known as "Telesoftware" or "software at a distance" as described in Wireless World, September 1977, page 50. In such a system instead of the coded data-pulses representing characters as in the present Teletext system, the data-pulses from the rows form a coded computer program for application to a computer such as a microprocessor which may be located within or outside the television receiver. If such a program were transmitted between pages of a conventional Teletext transmission the program would appear on the display screen of the receiver as an uncomprehensible display. In order to prevent such a display with existing decoder designs the "Page" or "Pages" containing the computer program could be headed by a Secondary

Page Header Row that falls outside the present Rows 0 to 23. This Secondary Page Header Row could also prevent the display of such a page where this row number is also used as the header for other pages which are to be displayed. This Secondary Page Header Row could then include a code or codings which prevents the display of the page, such a position for these being the Control Bits C12, C13, C14. The information could then be in the following form:-

Row 0 Page *n* Control Characters to have normal function

Row 1 character data

Row 23 character data

Row 0 Page 15 15 (Terminator)

Row 30 Page *n*+1 Control Characters to form computer program, display to be blanked.

Row 1 Character Bytes form program data

Row 23 Character Bytes form program data

etc.

A block diagram of a Teletext Decoder in a television receiver T for use with the above described systems is shown in Figure 6. A vision demodulator 1 in the television receiver produces a demodulated video signal from a television signal applied to the receiver. This video signal is applied to a video processor circuit 2 in which the Teletext data in serial form and contained usually during two line periods of each field blanking period is separated from the vision signal, the serial data appearing at an output 3. Clock pulses generated from the clock run-in sequence in the Teletext signal are produced in the video processor circuit 2 and appear at the output 4. The video processor circuit 2 also separates field and line synchronising pulses of the vision signal and which appear at the output 5. The data in serial form is applied from output 3 to the Teletext acquisition circuit 6 where it is converted to parallel form to appear at an output 7. The page selection takes place in the teletext acquisition circuit 6, selection taking place from a user control 8 which may also control other functions, the user control commands being applied to the input 9 of the acquisition circuit 6. Writing in of the parallel data information from output 7 to a page memory 10 is carried out under the control of row address signals for the selected page which appear at an output 11 of the teletext acquisition circuit 6 and a write control signal appearing at an output 11 both inputs being connected to the page memory 10. The parallel character data for the selected page is read out from the page memory 10 at an output 13 under the control of timing signals which are applied to the page memory 10 from an output 14 of display timing circuits 15 which is synchronised by the signals from the output 5 of the video processor circuit 2. The character data from output 13 is applied to a character generator 16 which under the control of timing signals at an output 17 of the timing circuits produces a video signal at an output 18 comprising the characters according to the character codes in the Teletext signal for application to the display D in the television receiver. The display timing circuits 15 at an output 19 produces line and field synchronising signals for the display D.

The Teletext acquisition circuit 6 of Figure 6 is shown in greater detail in the block diagram of Figure 7, the blocks and connections shown in full line being required for decoding Teletext pages having a Page Header Row 0 and may be required for use with pages having a Secondary Page Header whilst those shown in broken line are required only for pages having the Secondary Page Header. The serial data from the output 3 of the video processor circuit 2 of Figure 6 is applied to the input D of a serial to parallel conversion circuit 20 and read out along eight parallel data lines from an output 21 as parallel data.

Seven of these code bits (the eighth being a parity bit) are applied from the output 7 to the page memory circuit 10 of Figure 6, whilst all eight code bits are applied from the output 21 to a Hamming and parity check unit 22. If check unit 22 does not confirm that parity is correct then a write control circuit 23 is inhibited for the incorrect character by means of a connection not shown in Figure 7. The four message bits of the Hamming protected word (see Figure 5) appear at an output 24 of check unit 22 and are applied to a row address latch 25 which stores the appropriate information to form at its output 26 the row address output 11 to address the page memory circuit 10 of Figure 6. A normal Page Header (Row 0) detector 27 detects the presence of Row 0 from the output 26 which is the Page Header Row so far used and when present provides an enable signal at an output 28 which is applied to comparison circuit 29 and control bit latches 30. The four message bits from output 24 are also applied to the comparison circuits 29 where they are compared with the selected page information from the user control 8 of Figure 6 and provide an output signal at an output 31 when the page selected has been received. The four message bits from output 24 are also applied to the control bit latches 30 to provide select control features for the standard Teletext transmission. The signal at output 31 sets a receive correct page flip-flop 32 which when set activates the write control circuits 23 to produce a signal at output 12 which allows the character data to be written into the page memory circuit 10. The next reception of a Row 0 produces a signal at output 28 which resets the flip-flop 32 which terminates the selected page. The whole sequence of the above operation is controlled from a bit counter 33 and decoder 34 which produces timing signals to the various circuits as shown connected when appropriate parts of the data information are available on the data lines. This is the operation of a standard Teletext decoder for receiving and displaying a Teletext page when that page commences with the Standard Page Header Row 0.

When a decoder has to receive a Teletext page which commences with a Secondary Header row (i.e. one of the Rows 24 to 31) the standard decoder has to be modified, some of the modifications being shown in Figure 7 by the blocks and connections shown in broken line. As stated previously it is necessary to terminate a page commencing with a standard Page Header Row 0 before a page commencing with a Secondary Page Header Row can be decoded in order to ensure correct operation of existing design decoders so that they will not respond to the coded information in the page commencing with the Secondary Page Header Row, this being done by transmitting the Row 0 for an unused page e.g. Page 15 15. On reception of the page commencing with the Secondary Page Header Row e.g. Row 24 the information is processed in a similar way to the previous page. The normal Page Header (Row 0) detector 27 will not detect the presence of the Secondary Page Header Row 24 and will therefore not produce at its output 28 the enable signal for the comparison circuits 29 or the control bit latches 30. The reset signal for the flip-flop 32 will have been produced by the terminator Row 0 Page 15 15. A secondary page header detector 35 is therefore provided for detecting the presence of the Secondary Page Header Row 24 to produce an enable signal at an output 36 which is applied through an OR gate 37 connected in the line between output 28 and the comparison circuits 29 to enable the comparison circuits in the same way as before. The enable signal is also applied from output 36 to enable secondary control bit latches 38 and also to as data to a normal/new type page latch 39 which is clocked by the output 31 of comparison circuits. The outputs 40 and 41 respectively of the latches 38 and 39 are used to control facilities not provided with the normal Teletext signal and which place a new interpretation on the coding of the signals received with a page commencing with the Secondary Page Header Row as explained previously and which could be the selection of a different character generator or a modification to the existing character generator to produce a different or modified character set for a different language or a change to the meaning of the control codes such as Graphics Hold. The blocks and connections shown in broken lines in Figure 7 may be repeated for each of the possible Secondary Page Header Rows 24 to 31 or parts may be repeated where the Control Bits C12, C13 and C14 are given different meanings in one Secondary Page Header Row.

Figure 8 shows in block diagram form the memories and character generators for use with the system as described above where a Teletext page having a Secondary Page Header is transmitted twice where during the first transmission the Character Bytes define which character set is to be selected for each character location on the display whilst during the second transmission the Character Bytes convey character data which is interpreted by the selected character generator. When a Teletext signal is received having a normal Page Header Row 0 the character data is decoded as explained in relation to Figure 6 i.e. the codes are stored in the page memory 10 to be read out and applied to the character generator 16 here called the No. 1 character generator to produce the video signal for display at its output 18, the character generator producing the normal characte set associated with Teletext i.e. that shown in Figure 3. On receipt of a Teletext page having a Secondary Header Code Row e.g. Row 27 as in the example above, the control signals from

outputs 40 and 41 of the Teletext data acquisition circuit (Figure 7) are applied to a decoder 42 for these control signals which during the first transmission of the page produces an enable signal at its output 43 which is applied to a character set memory 44. The data from output 7 of the Teletext acquisition circuit is entered into the character set memory 44 during this first transmission passing, if necessary, through a Hamming check or code conversion circuit 45. During the second transmission of the page the codes applied to the decoder 42 produces an enable signal at the decoder output 46 which is applied to the normal page memory 10 and into which are entered the character codes from the output 7. The information in the two memories 10 and 44 are read out simultaneously, that from the character set memory 44 being applied from its output 47 to an N bit decoder 48 which decodes the stored codes and applies an enable signal from one of its outputs 49 to one of a number of character generators 16, 50, 51, 52 there being an equal number of character generators to the required number of character sets. The character generator enabled depends on the character set from which the character is to be selected at a particular display location. The character data from the output 13 of memory 10 is applied in parallel to all the character generators but only the generator enabled produces a character from the selected set at that display location at the commenced output 18 in the form of a video signal for display purposes. This is repeated for each location of the display.

If it was required for it to be possible to change the character set only at each Row of a page rather than at each display location then the size of the character set memory 44 which is shown to be 40 × 24 × N, where N is the number 1 character sets, could be reduced to 24 × N.

WHAT WE CLAIM IS:-

1. A television transmission system of a character such that data pulses coded in a given manner to represent a message comprising specific alpha-numeric text or other message or graphical information are transmitted in a video signal in at least one television line in intervals where no picture signals representing normal picture information are present, the message comprising a plurality of rows, the pulses for each row being contained in a television line, one of said rows containing a message-starting and/or identification signal when the coding of said message is to be interpreted in a corresponding given manner, an alternative row other than one of those employed when the data pulses are coded in said given manner being employed to contain the message-starting and/or identification signal when the message is contained in that row or a plurality of rows and the coding of the data pulses is to be interpreted in a manner which differs or varies from that of the given manner.

2. A television transmission system as claimed in Claim 1, in which a current message having said one row containing the message-starting and/or identification signal also contains a terminating signal for a preceding message, the current message being terminated by a row without a message-starting signal when said current message is followed by a message commencing with said alternative row.

3. A television transmission system as claimed in Claim 1 or 2, in which the text of the message having said one row containing the message-starting and/or identification signal is in a first language whilst the text of the message having said alternative row containing the message-starting and/or identification signal is in a second language.

4. A television transmission system as claimed in Claim 1 or 2, in which the text of the message having said one row containing the message-starting and/or identification signal is in a first language whilst the text of the message having said alternative row containing the message starting and/or identification signal is in different languages for different rows.

5. A television transmission system as claimed in Claim 4, in which an alternative row other than one of those employed when the message is in said first language is transmitted between adjacent rows when in different languages.

6. A television transmission system as claimed in Claim 1 or 2, in which the text of the message having said one row containing the message-starting or identification signal is in a first language whilst the characters of each row from the message having said alternative row containing the message-starting and/or identification signal may be selected from different character sets such that different parts of the message in each row may be in different languages.

7. A television transmission system as claimed in Claim 6, in which the message having said alternative row containing the message-starting and/or identification signal is transmitted twice, the first transmission of said message indicating for each character position in a row the character set from which the character codes for each corresponding position in a row are to be derived during the second transmission.

8. A television transmission system as claimed in Claim 1 or 2, in which variations in the interpretation of the coding of the data pulses is achieved by the selection during at least parts of the message having said alternative row containing the message-starting and/or identification signal of characters or graphical information transmitted in dot coded form.

9. A television transmission system as claimed in Claim 8, in which the message having said one row containing the message-starting and/or identification signal when decoded derives its characters from a first character set, the message having said alternative row containing the message-starting and/or identification signal being transmitted twice with the dot coded characters or graphical information being transmitted during the first transmission whilst character codes are transmitted during the second transmission which when decoded derives some of its characters or graphical information from said first character set and the remaining from the previously transmitted dot coded characters or graphical information.

10. A television transmission system as claimed in Claim 1 or 2, in which the interpretation for the coding of at least one control character contained in said message having said alternative row containing the message-starting and/or identification signal differs from the interpretation for the coding of that control character when contained in said message having said one row containing the message-starting and/or identification signal.

11. A television transmission system as claimed in any of the preceding claims, in which said alternative row contains a further signal which indicates the nature of the differences or variation in interpretation of the coding of the data pulses.

12. A television transmission system as claimed in Claim 11, in which said further signal is contained in control codes following the message-starting and/or identification signal.

13. A television transmission system as claimed in Claim 11, in which said further signal is that which indicates the row number.

14. A television transmission system substantially as herein described with reference to the accompanying drawings.

15. Decoding apparatus for a television transmission system as claimed in Claim 1, said apparatus comprising means for providing a demodulated video signal containing data pulses coded in a given manner to represent a message comprising specific alpha-numeric text or other message or graphical information during at least one television line in intervals where no picture signals representing normal picture information are present, the message comprising a plurality of rows each row being contained in a television line, means for separating the television lines containing said rows from said demodulated video signal, means for responding to one of said rows which contains a message-starting and/or identification signal and for decoding said message such that its coding is interpreted in a corresponding given manner, means for responding to an alternative row other than one of those employed when the data pulses are coded in said given manner and which contains the message-starting and/or identification signal and for decoding said message such that its coding is interpreted in a manner which differs or varies from that of said given manner, and means for producing a vision signal containing said message for display purposes.

16. Decoding apparatus as claimed in Claim 15, in which a first character generator is provided for producing characters from a first character set from character codes in said message having said one row containing said message-starting and/or identification signal, a second character generator being provided for producing characters from a second character set from character codes in said message having said alternative row containing said message-starting and/or identification signal.

17. Decoding apparatus as claimed in Claim 15, in which a first character generator is provided for producing characters from a first character set from character codes in said message having said one now containing said message-starting and/or identification signal, further character generators being provided for producing characters from further character sets from the character codes in different rows in said message having said alternative row containing said message-starting and/or identification signal.

18. Decoding apparatus as claimed in Claim 15, in which a first character generator is provided for producing characters from a first character set from character codes in said message having said one row containing said message-starting and/or identification signal, further signal generators being provided for producing characters from further character sets from the character codes in said message having said alternative row containing said message-starting and/or identification signal, and means capable of selecting characters from different character sets at different character code positions in said message.

19. Decoding apparatus as claimed in Claim 15, in which a first character generator is provided for producing characters from a first character set from character codes in said message having said one row containing said message-starting and/or identification signal, a character set memory for storing characters or graphical information when transmitted in dot coded form in a first transmission of said message having said alternative row containing said message-starting and/or identification signal, and means for deriving characters or graphical information from said first character generator or said character set memory during a second transmission of said message having said alternative row containing said

message-starting and/or identification signal.

20. Decoding apparatus substantially as herein described with reference to the accompanying drawings.

21. Television display apparatus incorporating decoding apparatus as claimed in any of the preceding Claims 15 to 20 and further comprising display means for displaying the decoded message.

22. Television display apparatus substantially as herein described with reference to the accompanying drawings.

R. J. BOXALL,
Chartered Patent Agent,
Berkshire House,
168-173 High Holborn,
London WC1V 7AQ.
Agent for the Applicants.

Printed for Her Majesty's Stationery Office, by Croydon Printing Company Limited, Croydon, Surrey, 1981.
Published by The Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.

1586431 COMPLETE SPECIFICATION
7 SHEETS *This drawing is a reproduction of the Original on a reduced scale*
Sheet 1

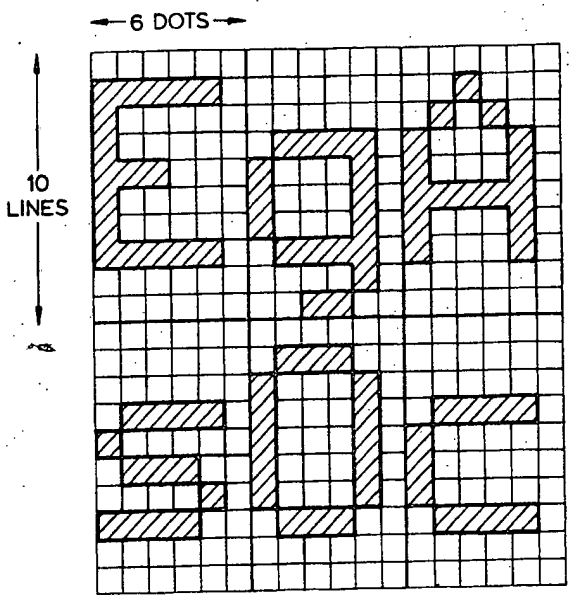


Fig.1 CHARACTERS DISPLAYED ON A 6x10 MATRIX

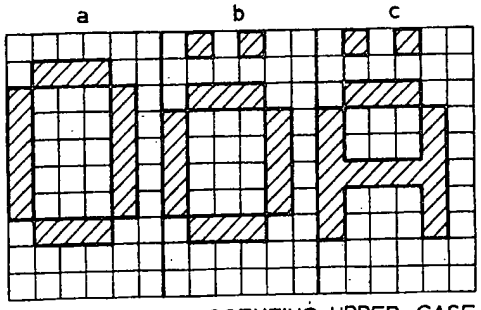
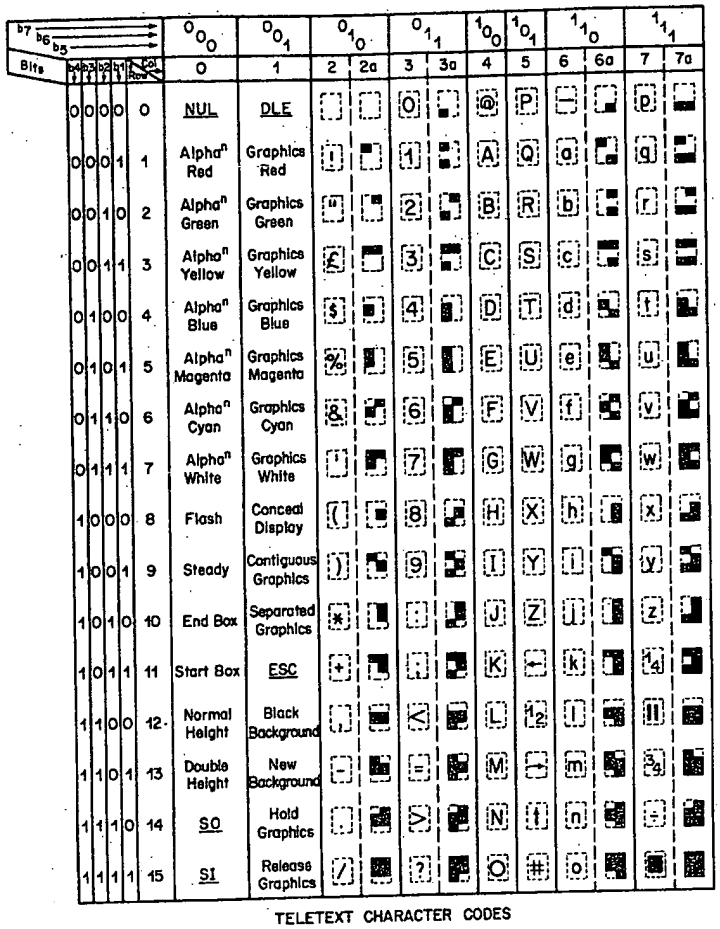


Fig. 2 ACCENTING UPPER-CASE SYMBOLS



TELETEXT CHARACTER CODES

Fig. 3

b_4	b_3	b_2	b_1		b_7 0	0	0	0	1	1	1	1
					b_6 0	0	1	1	0	0	1	1
					b_5 0	1	0	1	0	1	0	1
					0	1	2	3	4	5	6	7
0	0	0	0	0	NUL	TC	SP	0		P		p
0	0	0	1	1	TC	DC	!	1	A	Q	a	q
0	0	1	0	2	TC	DC	"	2	B	R	b	r
0	0	1	1	3	TC	DC	#	3	C	S	c	s
0	1	0	0	4	TC	DC	¤	4	D	T	d	t
0	1	0	1	5	TC	TC	%	5	E	U	e	u
0	1	1	0	6	TC	TC	&	6	F	V	f	v
0	1	1	1	7	BEL	TC	'	7	G	W	g	w
1	0	0	0	8	FE	CAN	(	8	H	X	h	x
1	0	0	1	9	FE	EM	)	9	I	Y	i	y
1	0	1	0	10	FE	SUB	*	:	J	Z	j	z
1	0	1	1	11	FE	ESC	+	;	K		k	
1	1	0	0	12	FE	IS	,	<	L		l	
1	1	0	1	13	FE	IS	-	=	M		m	
1	1	1	0	14	SO	IS	.	>	N		n	
1	1	1	1	15	SI	IS	/	?	O		o	DEL

▨ — 11 National use options

Fig. 4

1586431 COMPLETE SPECIFICATION

7 SHEETS

This drawing is a reproduction of the Original on a reduced scale

Sheet 4

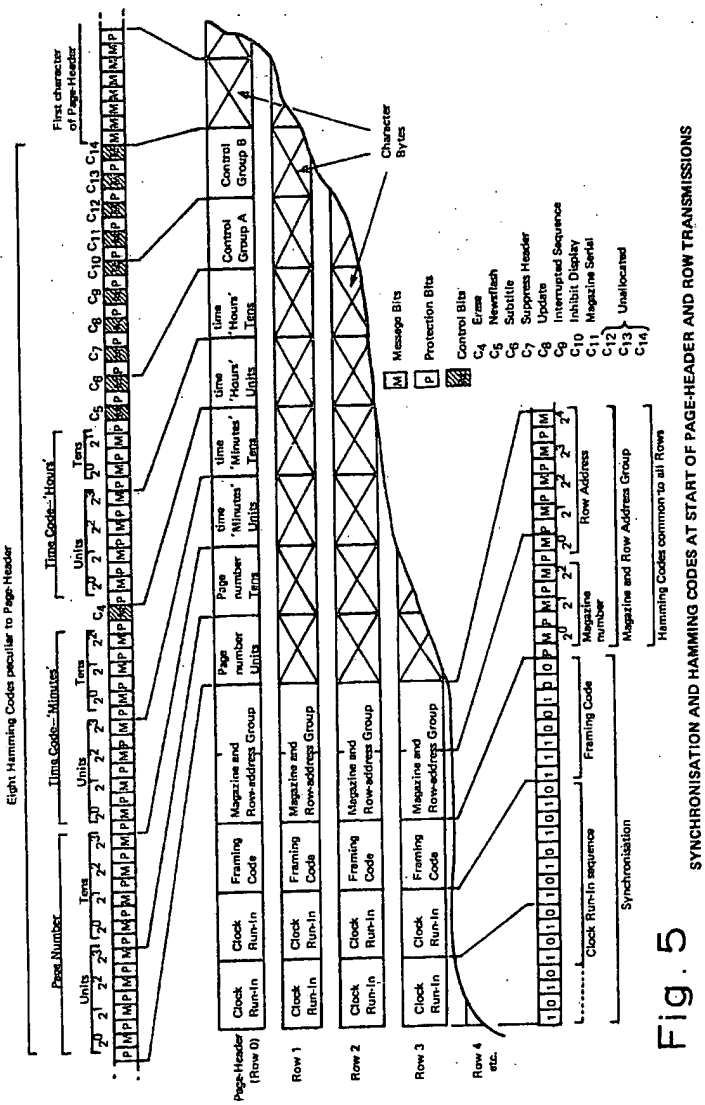


Fig. 5 SYNCHRONISATION AND HAMMING CODES AT START OF PAGE-HEADER AND ROW TRANSMISSIONS

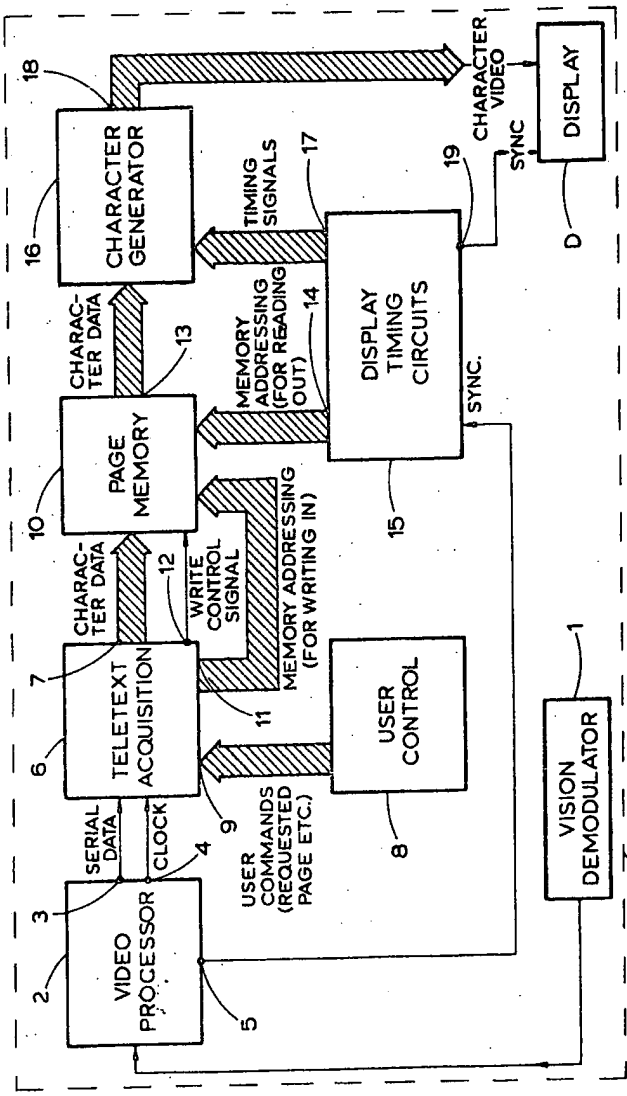

VIDEO PROCESSOR
TELETEXT ACQUISITION
PAGE MEMORY
CHARACTER GENERATOR
DISPLAY TIMING CIRCUITS
USER CONTROL
VISION DEMODULATOR
DISPLAY
SERIAL DATA
CLOCK
CHARAC-TER DATA
WRITE CONTROL SIGNAL
MEMORY ADDRESSING (FOR WRITING IN)
MEMORY ADDRESSING (FOR READING OUT)
TIMING SIGNALS
CHARACTER VIDEO
SYNC
SYNC.
USER COMMANDS (REQUESTED PAGE ETC.)
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
D
T

Fig. 6

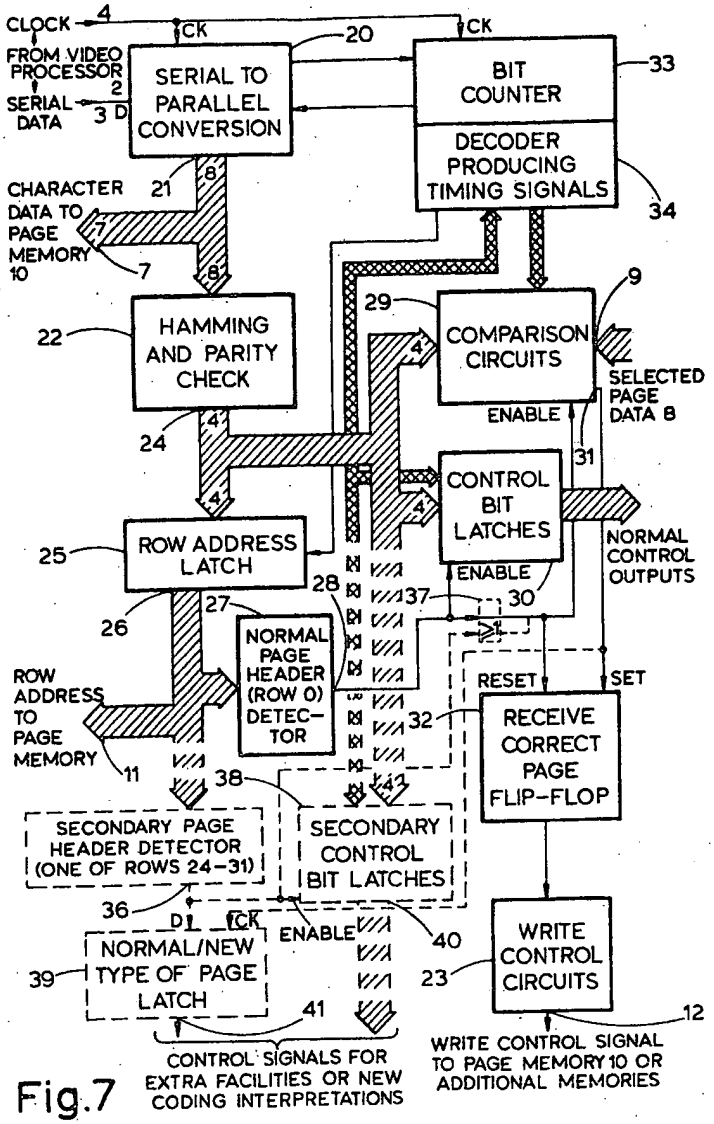

CLOCK
4
CK
20
CK
FROM VIDEO PROCESSOR
2
SERIAL DATA
3 D
SERIAL TO PARALLEL CONVERSION
BIT COUNTER
33
DECODER PRODUCING TIMING SIGNALS
34
CHARACTER DATA TO PAGE MEMORY 10
21
8
7
HAMMING AND PARITY CHECK
22
29
COMPARISON CIRCUITS
9
SELECTED PAGE DATA 8
ENABLE
31
24
CONTROL BIT LATCHES
NORMAL CONTROL OUTPUTS
25
ROW ADDRESS LATCH
ENABLE
30
28
37
27
26
NORMAL PAGE HEADER (ROW 0) DETECTOR
RESET
SET
ROW ADDRESS TO PAGE MEMORY
11
32
RECEIVE CORRECT PAGE FLIP-FLOP
38
43
SECONDARY PAGE HEADER DETECTOR (ONE OF ROWS 24–31)
SECONDARY CONTROL BIT LATCHES
36
D
CK
ENABLE
40
NORMAL/NEW TYPE OF PAGE LATCH
39
WRITE CONTROL CIRCUITS
23
12
41
CONTROL SIGNALS FOR EXTRA FACILITIES OR NEW CODING INTERPRETATIONS
WRITE CONTROL SIGNAL TO PAGE MEMORY 10 OR ADDITIONAL MEMORIES

Fig.7

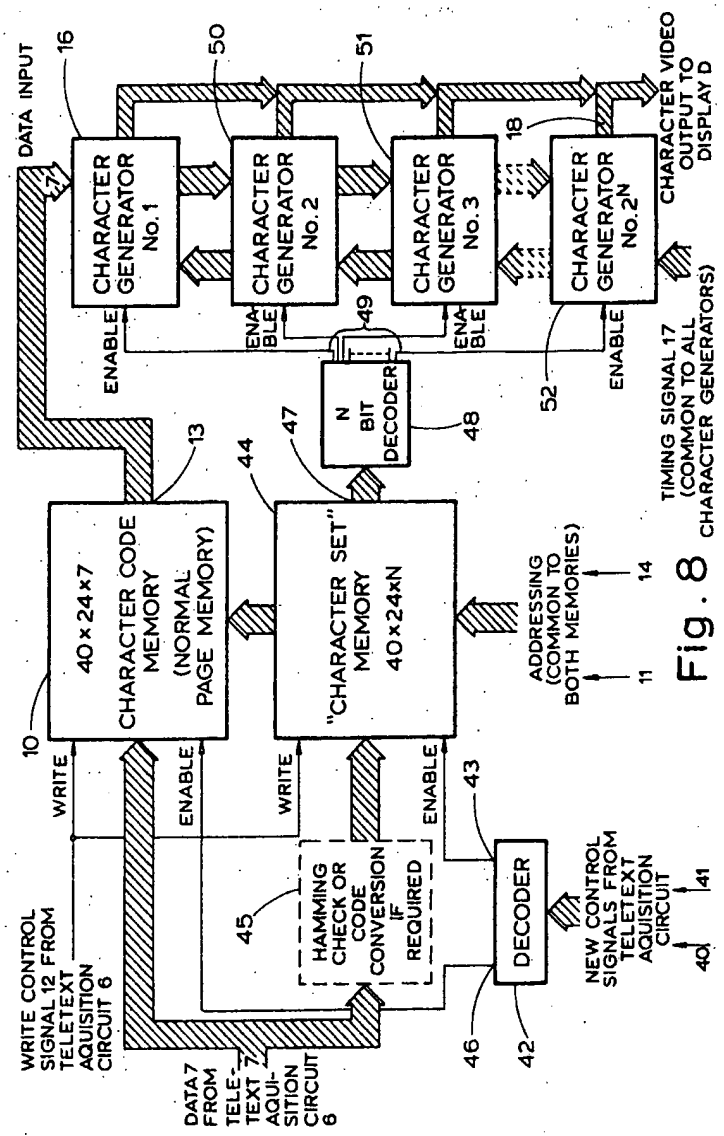

DATA INPUT
16
7
CHARACTER GENERATOR No. 1
50
CHARACTER GENERATOR No. 2
51
CHARACTER GENERATOR No. 3
18
CHARACTER GENERATOR No. 2^N
CHARACTER VIDEO OUTPUT TO DISPLAY D
ENABLE
ENABLE
49
ENABLE
52
ENABLE
N BIT DECODER
48
47
44
13
TIMING SIGNAL 17 (COMMON TO ALL CHARACTER GENERATORS)
40 x 24 x 7 CHARACTER CODE MEMORY (NORMAL PAGE MEMORY)
"CHARACTER SET" MEMORY 40 x 24 x N
ADDRESSING (COMMON TO BOTH MEMORIES)
14
11
10
WRITE
ENABLE
WRITE
ENABLE
43
WRITE CONTROL SIGNAL 12 FROM TELETEXT AQUISITION CIRCUIT 6
45
HAMMING CHECK OR CODE CONVERSION IF REQUIRED
DECODER
NEW CONTROL SIGNALS FROM TELETEXT AQUISITION CIRCUIT
41
40
DATA 7 FROM TELE-TEXT AQUI-SITION CIRCUIT 6
46
42

Fig. 8